U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE

HEARING CHARTER

Strengthening Windstorm Hazard Mitigation: An Examination of Public and Private Efforts

Monday, February 9, 2004
1:30 - 3:30 PM (CST)
Texas Tech University, Merket Alumni Center
Lubbock, Texas

1. Purpose

On Monday, February 9, 2004, at 1:30 p.m., the House Science Committee will hold a field hearing to examine the status of windstorm hazard mitigation in the United States, and to consider the role of federal research and development in windstorm hazard reduction.

2. Witnesses

Dr. Charles Meade is a senior physical scientist with the RAND Corporation's Science and Technology Policy Institute in Washington, DC. He is the primary author of *"Assessing Federal Research Developments for Hazard Loss Reduction",* a study prepared for the White House Office of Science and Technology Policy in 2003.

Dr. Ernst W. Kiesling is a Professor of Civil Engineering at Texas Tech University. Dr. Kiesling has 37 years of teaching, research, and administrative experience at Texas Tech University, including serving as Chairman of the Civil Engineering Department from 1969 to 1988. Dr. Kiesling was the first to develop an "in-residence" tornado shelter, providing occupant protection during tornadic events. The research provided the basis for a Federal Emergency Management Agency (FEMA) publication on in-residence shelter design.

Mr. Bryan Shofner is President of Shofner & Associates Insurance Agency in Lubbock, Texas. Mr. Shofner was named "Young Agent of the Year" in 2001 by the Independent Insurance Agents of Texas. Mr. Shofner has been a longtime member of his local, state, and national independent insurance agents associations, including serving as president of the Lubbock Association of Insurance Agents.

Dr. Bogusz Bienkiewicz is a Professor of Civil Engineering at the Colorado State University Wind Engineering and Fluids Laboratory. Dr. Bienkiewicz is also the Vice President of the American Association for Wind Engineering, Secretary of the American Society of Civil Engineers Committee on Wind Effects, and co-chairman of the International Wind Engineering Forum.

3. Overarching Questions

The hearing will address the following overarching questions:

1. How vulnerable is the built environment in the United States to windstorm hazards? What are some of the top opportunities for, and primary barriers to, reducing these vulnerabilities?

2. What is the size, structure, and focus of federal wind hazard mitigation efforts, particularly with regard to research and development?

3. What gaps in data exist with regard to our knowledge and understanding of windstorm hazards, and how could the overall wind hazard mitigation portfolio be refocused or otherwise strengthened to improve mitigation in the United States?

4. How can non-federal entities such as the insurance industry and state and local governments contribute to, and benefit from, improved wind hazard mitigation?

4. Brief Overview

- The United States currently sustains several billion dollars each year in property and economic losses due to windstorms. While estimates of annualized windstorm damages are highly variable and limited in scope, the National Weather Service estimates that between 1995 and 2002, hurricanes, tornados, and thunderstorm winds caused on average $4.5 billion in damage per year. The American Society of Civil Engineers has estimated windstorm damages to be in excess of $5 billion per year.

- The most powerful hurricane in the last century to hit the United States was Hurricane Andrew, in August of 1992. It caused 58 deaths and approximately $27 billion in damages. In addition, more than one million people were evacuated from Southern Florida because of the storm.

- A variety of cost-effective windstorm hazard mitigation measures exist, and many more are undergoing research and development. It is unclear to what extent these mitigation technologies have been adopted, but it is generally agreed that they have been under-utilized, and that significant improvements in the wind resistance of buildings and other structures will not be achieved without improved incentives at the local and individual level. This fact, combined with growing populations in coastal areas particularly susceptible to major windstorms, has led to substantial increases in the overall windstorm vulnerabilities.

- Federal windstorm hazard mitigation efforts span several agencies, including the Federal Emergency Management Agency (FEMA), National Institute of Standards and Technology (NIST), National Oceanographic and Atmospheric Administration (NOAA), National Science Foundation (NSF), and the Department of Energy (DOE). Evaluations of the size, scope, and effectiveness of these mitigation efforts have found significant room for improvement. For example, a 1999 report by the National Academy of Sciences found that: "…there is still a lack of leadership, focus, and coordination of

wind-hazard mitigation activities across all agencies, and funding for research and development specifically targeting wind-hazard reduction issues is insufficient."

5. Background

Hurricanes and Tornados

High winds can easily destroy poorly constructed buildings and mobile homes. Hurricanes can reach constant wind speeds greater than 155 mph and extend outward as far as 400 miles. While the National Weather Service is able to detect hurricanes days before they make landfall, predicting when, where, and with what force a hurricane will hit remains an inexact science.

Tornados generally occur near the trailing edge of a thunderstorm, though they are also often produced by hurricanes. Tornado winds can reach up to 300 mph and can be powerful enough to lift homes off foundations. Tornados are much more difficult to detect than hurricanes with an average lead-time for warnings of only 12 minutes. This makes evacuation nearly impossible, a factor that led to the development and implementation of in-residence tornado shelters, developed from research performed at Texas Tech University.

Since 1950, tornados have claimed over 4,400 lives. Texas has been particularly vulnerable, averaging 124 tornados each year—more than double the average of any other state. On May 11, 1970, a tornado ripped through downtown Lubbock, Texas, killing 26 people, injuring at least 1,500 more, and causing more than $530 million in damage.

While the federal government does not maintain a comprehensive windstorm loss database, the National Weather Service does compile damage estimates that demonstrate the tremendous costs of windstorms (table 1). Also, the insurance industry maintains separate loss databases that measure damage to insured property. However, according to *"Disasters by Design: A Reassessment of Natural Hazards in the United States,"* a 1999 report by the National Academy of Sciences, insurance industry data may represent only a small percentage of total losses because many property owners do not buy coverage against hurricanes and other natural hazards.

Table 1. National Weather Service Estimates of Windstorm Impacts (1995-2002)

	Fatalities			Injuries			Total Damages (In millions of $)		
Year	Tornados	Hurricanes	T-storm Winds	Tornados	Hurricanes	T-storm Winds	Tornados	Hurricanes	T-Storm Winds
2002	55	51	17	968	346	287	802.1	1382.4	344.5
2001	40	24	17	743	7	341	637.5	5190.5	378.8
2000	41	0	25	882	1	296	430.5	8.2	304
1999	94	19	29	1842	10	325	1998.2	5068.8	388.7
1998	130	9	41	1868	77	860	1736.2	4127.9	1597.3
1997	67	1	37	1033	32	425	736.5	875.4	242.1
1996	25	37	23	705	22	335	732.1	1787	452.8
1995	30	17	38	650	112	473	410.8	5932.3	745.1

With more people than ever before living near coastlines, vulnerability to wind hazards in the U.S. is steadily increasing. Already, more than one in six Americans live in a county that lies next to the eastern Atlantic or Gulf of Mexico coast. In addition, the coastal population is

growing rapidly, particularly from Texas through the Carolinas. In popular resort areas that are common along the coastline, numbers often swell even further when holiday, weekend, and vacation visitors arrive. These large and increasing populations have resulted in substantial increases in buildings and infrastructure in high-risk coastal areas that are also vulnerable to windstorms.

Federal Windstorm Hazard Mitigation Efforts

The size and scope of federal investments in windstorm hazards research and development (R&D) is generally agreed to be in the range of a few million dollars, though specific numbers are hard to come by, in part because of the fragmented and uncoordinated nature of these efforts. Agencies contributing to this effort include FEMA, NOAA, NIST, NSF, and DOE.

The bulk of the windstorm hazard funding is directed toward fundamental research and development into the atmospheric and meteorological aspects of windstorms, contributing to a greater understanding of weather-related phenomena, but generally without specific mitigation applications in mind. A smaller portion of the windstorm hazard research and development effort is directed toward structural and engineering aspects of buildings and infrastructure impacted by windstorms. In a 1999 report, the National Academy of Sciences recommended that: "The federal government should coordinate existing federal activities and develop, in conjunction with state and local governments, private industry, the research community, and other interested stakeholder groups, a national wind-hazard reduction program. Congress should consider designating sufficient funds to establish and support a national program of this nature."

Unfortunately, simply developing technical solutions will not reduce vulnerability to wind hazards. FEMA and the insurance industry have both determined that improving the wind resistance of buildings will only be achieved when there is a demand for wind-resistant construction by homeowners. Solving the wind-vulnerability problem will not only require coordinated work in scientific research and technology development, but education, public policy, the behavioral sciences, and technology transfer as well.

6. Questions for Witnesses

The witnesses were asked to address the following questions in their testimony:

<u>Dr. Meade</u>

- What regions of the country and characteristics of the built environment are most vulnerable to windstorm hazards? Are these vulnerabilities increasing or decreasing, and why? What are some of the opportunities for, and primary barriers to, reducing these vulnerabilities?

- Approximately how much money does the federal government spend per year on wind hazard mitigation research and development? Where is this effort currently focused (i.e. direct vs. indirect research, engineering, economic, meteorological, etc.)? Where are the primary gaps with regard to our knowledge and understanding of windstorm hazards? How could the federal wind hazard research and development portfolio be refocused or otherwise strengthened to improve mitigation in the United States?

<u>Dr. Bienkiewicz and Dr. Kiesling</u>

- What regions of the country and characteristics of the built environment are most vulnerable to windstorm hazards? Are these vulnerabilities increasing or decreasing, and why? What are some of the top opportunities for, and primary barriers to, reducing these vulnerabilities?

- What are some of the processes that are in place for transferring new technologies to government agencies and the private sector for implementation? What role do the research activities at Texas Tech University and Colorado State University play in implementation of new mitigation techniques?

- What steps could be taken to strengthen the federal wind hazard research and development portfolio in the United States, particularly with regard to planning, coordination, and focus within the research and development portfolio?

Mr. Shofner

- How would you characterize the size and focus of ongoing wind hazard mitigation research and development being performed by the insurance industry? To what extent do insurance industry research efforts build on research done by universities or the government, and vice-versa? How does the insurance industry work with federal, state, and local governments to share data that may help contribute to windstorm hazards reductions?

- Approximately how much damage do wind hazards cause in the United States on an annual basis, and are these damages broken down by variables such as building types, structural characteristics, and geography? What types of damage are taken into account in compiling these damage estimates, and what types are not included? What data gaps exist with regard to our knowledge and understanding windstorm hazards?

- What role does the insurance industry play in encouraging implementation of existing mitigation techniques in retrofitting and new home construction? To what extent do insurance policies consider and incorporate incentives for implementation of these mitigation techniques?